A year has passed since completion of the Tevatron Phase I Design Report. There have been a number of advances in cooling since then, both here and at CERN. It is an appropriate time for a final review of our plans before detailed design work is undertaken. A study week was therefore held November 10 through 14 to investigate and possibly to improve the antiproton cooling scenario to be used in the Tevatron Phase I colliding-beams project. Our collaborators from Wisconsin, Argonne, and Berkeley participated, as well as visitors from CERN, DESY, and Brookhaven.

One of the concerns in the original Tevatron I plan is the heating of the antiproton target during the beam pulse, which could reduce the antiproton production. Several targeting scenarios were proposed to reduce this heating. Some schemes target segments of the Main-Ring proton beam sequentially, stacking the antiprotons from separate segments together after production and some cooling. A scheme invented at an earlier targeting workshop moves the proton beam laterally across the target faster than the shock wave generated by the beam (total motion is of the order of 1 mm). It may also be possible to target the entire Main Ring beam on a multiple target, a sequence of current-carrying targets interspersed with lithium lenses. Combinations of these targeting schemes are also interesting. These possibilities raised in connection with the study week are being explored further.

During the study week, cooling scenarios involving only stochastic cooling were proposed. These schemes are not completely different from the CERN Antiproton Accumulator system, but one of the targeting-injecting systems discussed above is needed, because in our case the initial proton beam comes in units of Main-Ring length and must be segmented to fit in a smaller ring. In addition, any all-stochastic scenario needs another storage ring in which to accumulate particles or a shutter system and large aperture like that at CERN.

Electron cooling was also advanced during the study week. Cooling at higher energy was explored. It was shown that cooling at 380 MeV, the limit of the present ring, is more efficient than at 200 MeV. The interesting possibility of cooling at 1 or 2 GeV was also raised. In this method, a high-voltage power-supply system, such as a Van der Graaf or Cockcroft-Walton, would be used.

One result of the week was that many schemes for targeting and cooling involve precooling rings of similar radius and aperture. We are exploring further the possibility of designing a ring that could accommodate any of these schemes with only small modifications.
The study week showed that there are a number of scenarios that can meet the Tevatron Phase I goal of $10^{36}/\text{cm}^2\text{-sec}$ luminosity, with room for improvement. We are now working on detailed calculations of these scenarios.